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ABSTRACT

The report details development, at Southwest Texas State University and later at Pennsylvania State University, of a computer authoring system ("Libra") enabling foreign language faculty to develop multimedia lessons focusing on listening comprehension. Staff at Southwest Texas State University first developed a Macintosh version of the system, then secured consultants to develop an IBM-compatible version. The authoring system and lessons initially created with it were tested, and 45 faculty from this and other institutions were trained in workshops to use the authoring system. Trainees developed lessons in Chinese, French, German, Russian, and Spanish. It is proposed that the system contains features central to students' acquisition of listening comprehension skills. Faculty trainees also found the system easy to use. Separate assessments of the instructional effectiveness of French, Spanish, and German lessons in controlled experimental conditions found them to be effective in improving student skills. It is concluded that while the project required greater effort and closer interinstitutional coordination of project activities, the results are successful and project-related efforts will be continued. Appended materials include a journal article about the authoring system and project director's comments. (MSE)

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Project Title:
Interactive Video Listening Comprehension in Foreign Language Instruction: Development and Evaluation

ED 414 741

Grantee Organization:
(Please indicate if the name of the grantee organization changed subsequent to the grant.)

Southwest Texas State University
601 University Drive
San Marcos, TX 78666

Grant Number:

P116BO1476

Project Dates:

Starting Date:	September 1, 1990
Ending Date:	August 31, 1996
Number of Months:	72

Project Director:

Robert Fischer
Department of Modern Languages
Southwest Texas State University
601 University Drive
San Marcos, TX 78666
Telephone: 512/245-2360

FIPSE Program Officer(s): Sandra Newkirk

Grant Award:

Year 1	$59,593
Year 2	$87,037
Year 3	$103,572
Total	$250,202

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Summary

Project teams at Southwest Texas State University and the Pennsylvania State University developed *Libra*, a computer authoring system enabling foreign language faculty to develop multimedia lessons focusing on foreign language listening comprehension. We have presented *Libra* at a number of professional meetings and conducted several faculty authoring workshops across the country. By the end of the three-year grant period, 60 faculty members had used *Libra* to make multimedia lessons in a variety of languages. Evaluation of the authoring system itself and lessons created by means of it indicates that *Libra* has had a significant impact on the foreign language teaching profession.

Robert Fischer

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Title of product: *Libra Authoring Environment for Multimedia Lessons*

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Executive Summary

Project Title:
Interactive Video Listening Comprehension in Foreign Language Instruction: Development and Evaluation

Grantee organization and address:
Southwest Texas State University
601 University Drive
San Marcos, TX 78666

Name and telephone number of project director:
Robert Fischer
512/245-2360

A. Project Overview

Project teams at Southwest Texas State University and, eventually, at the Pennsylvania State University developed the *Libra* computer authoring system to enable foreign language faculty to create multimedia lessons. The project team at Southwest Texas State University developed the Macintosh version of the authoring system. After considerable delays in the development of the IBM-compatible version of the authoring system (and several requests for no-cost extensions), we replaced the original IBM-compatible developer in June 1995 by a second developer who has now completed a Windows version of *Libra*.

We devoted the first year and a half to designing and developing the Macintosh version of the authoring system. Beginning in the second year of the project, we started demonstrating the preliminary version of the authoring system at professional meetings. By the midpoint of the third year, we began offering faculty training workshops at professional meetings and universities across the country.

We evaluated the authoring system and lessons created by means of it at various stages during the three years of the project. These evaluations included consultants' initial assessment of *Libra*'s design, faculty users' views of *Libra*'s instructional purpose and ease-of-use, and measurements of the extent of the instructional effectiveness of student lessons. Results of these evaluation studies provided substantial evidence that *Libra* has had a significant impact on the foreign language teaching profession and students' foreign language learning efforts.

B. Purpose

Computer-Assisted Language Learning (CALL) has become an integral part of the foreign language instruction but has not yet reached its full potential. The primary reason for the lack of sustained achievement lies in the fact that most foreign language faculty do not have the expertise, nor the time to gain the expertise, to write computer programs. Authoring systems, which subsume many of the technical tasks associated with writing computer programs, offer promising approaches to courseware development. We created *Libra* to meet the need of enabling faculty authors to develop multimedia lessons focusing on listening comprehension and containing the pedagogical components necessary for students to acquire appropriate listening comprehension skills.

Once we had created *Libra* and evaluated its design, we then disseminated the authoring system in a such way to assure its proper use. We conducted faculty authoring workshops to train faculty not only how to use *Libra*'s authoring tools but also how to create lesson designs that would truly advance students' listening comprehension proficiency.

C. Background and Origins

We had received previous grants to develop computer-based language learning materials and to train high school teachers to develop drill-and-practice programs for grammar and vocabulary learning. With the advent of the widespread availability of foreign language videodiscs and the need for a multimedia authoring system, we realized that substantial grant funds would be necessary to support the development of an authoring system. We had enjoyed the support of the administration at our university, but we understood that

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such an extensive development project could not be undertaken with their support alone. It is for this reason that we approached FIPSE for funding. Once funded, we continued to enjoy the full financial and administrative cooperation of our university.

Because our university was essentially a Macintosh campus, we secured the cooperation of personnel at the US Naval Academy to develop an IBM-compatible version of *Libra*. We selected the personnel from the Naval Academy because of their standing in the CALL profession, their development of an earlier authoring system for IBM-compatibles, and their interest in the pedagogical approach we had adopted for our authoring system. Unfortunately, the personnel at the Naval Academy were not able to complete the IBM-compatible version, even after repeated extensions to our original agreement. We finally had to cancel our cooperative agreement with the Naval Academy in March 1995 and entered into a new cooperative agreement with personnel at the Pennsylvania State University in June 1995. That group completed its work in August 1996, and we will hold our first joint Macintosh/IBM-compatible faculty authoring workshop in summer 1997.

D. Project Description

Our project had four main goals: 1) to develop a pedagogically well-defined authoring system to enable foreign language faculty to create multimedia listening comprehension lessons, 2) to produce and pilot multimedia lessons in three languages, 3) to evaluate the extent of the instructional effectiveness of these lessons, and 4) to train faculty from other educational institutions to use the authoring system.

We developed the Macintosh version of *Libra* in approximately one and one half years (1 September 1990 to 31 May 1992) and the IBM-compatible version in little more than a year (1 June 1995 to 31 August 1996). We initially estimated that it would take about ten hours per week to develop the authoring system, a serious underestimate. We spent a minimum of 15 hours per week discussing the design of the authoring system, implementing that design on the computer, and constantly improving the program as we considered new authoring components. The product that eventually emerged from the development process has become a leading computer application in the field of foreign language teaching.

The authoring system consists of a series of templates for basic expository displays, four question formats (supported by student feedback), and several kinds of help displays such as scripts and dictionaries. Its authoring procedures allow faculty to create multimedia controls, dialog boxes, hyperactive text, response-sensitive lesson controls, plus links to graphics, digitized audio, digitized video, and world wide web documents all in a "what-the-author-sees-is-what-the-student-gets" environment.

We produced and piloted three sets of multimedia lessons based on authentic video materials in French, German, and Spanish at our institution. In addition, faculty at three other institutions produced and piloted lessons in French, German, and Spanish. Although technically not part of our project, these faculty members had attended our first faculty authoring workshop and used the lessons they developed in the workshop in classes at their home institutions.

We evaluated the authoring system and student lessons created by means of it. These evaluation projects are described in section E below.

We trained faculty from other institutions how to use *Libra* in faculty authoring workshops at Computer Assisted Language Learning Consortium (CALICO) annual meetings, the US Naval Academy, the Language Acquisition Resource Center (LARC) at San Diego State University, and Southwest Texas State University. More than 45 teachers, who had varying degrees of computer experience, attended these workshops and developed lessons in Chinese, French, German, Russian, and Spanish.

E. Evaluation/Project Results

We initially evaluated the *Libra* authoring system by having two external consultants review the authoring system. Their reports revealed that *Libra*'s design clearly con-

tained features central to students' acquisition of listening comprehension proficiency. In addition, we requested that the faculty who attended the various faculty authoring workshops evaluate the degree to which *Libra* met their professional needs and the authoring system's ease-of-use. Faculty ratings revealed that Libra did in fact meet their requirements and was easy to use. LARC at San Diego State University did an evaluation independent of our own and found similar results.

We also evaluated the extent of the instructional effectiveness of French, Spanish, and German lessons in carefully controlled experimental situations at our institution. The French project measured the effect of lesson design on student learning. Students in the experimental group used *Libra* lessons which reflected our recommended lesson design. Students in the control group used *Libra* lessons which followed a more traditional instructional approach. Students in both groups used the same videodisc material. Students in the experimental group significantly outperformed students in the control group on all evaluation measures.

The Spanish project measured the impact of the interactive technology on student learning. Students in the experimental group used computer-based *Libra* lessons, while students in the control group used videotape versions of the same video material, supported by paper versions of the computer-based lessons' help displays. Over the course of the set of five lessons, students in the experimental group began to outperform students in the control group on lesson three and maintained their advantage over the remaining lessons. The reason for the lack of significant differences between the two groups for the first two lessons was apparently due to the fact that students in the experimental group were not aware of all the on-line help displays in the computer lessons.

The German project also sought to measure the effect of the technology on student learning. Students in the experimental group used computer-based *Libra* lessons, while students in the control group used videotape versions of the same video material. Unfortunately, the German faculty member essentially disregarded our recommendations for lesson design and developed lessons whose complexity confused students and detracted from their learning efforts. Students in the experimental group did not significantly outperform students in the control group on any evaluation measures.

The faculty at three other institutions evaluated their *Libra* lessons. The student populations at these institutions represent the broad spectrum of students in higher education today ranging from a highly selective private institution (Northwestern University), to a large research institution (the University of California at San Diego), to an open-admissions junior college (Austin Community College). The evaluation projects at these institutions showed that the *Libra* lessons had a measurable effect on student learning.

Taken altogether, the evaluation studies completed during the three-year period of the project showed that the *Libra* authoring system enabled faculty to create high-quality computer lessons and that well-designed *Libra* lessons significantly facilitated students' acquisition of listening comprehension proficiency.

F. Summary and Conclusions

Our project has provided benefits to the foreign language teaching profession as well as to our project team. *Libra* continues to be an important computer application in the profession, as evidenced by the number of inquiries and requests for workshops we receive. The members of our project team have also grown professionally as a result of their participation in the project. Our collaborative projects have allowed us to gain greater insights into the academic contexts of a variety of institutions and has given us a broader perspective in which to understand our own institution.

In summary, although the project required far greater effort and closer interinstitutional coordination of project activities than we originally anticipated, we have brought the project to very successful conclusion and are continuing to disseminate *Libra* to the foreign language teaching profession.

Final Report

Project Title:
Interactive Video Listening Comprehension in Foreign Language Instruction: Development and Evaluation

Grantee organization and address:
Southwest Texas State University
601 University Drive
San Marcos, TX 78666

Name and telephone number of project director:
Robert Fischer
512/245-2360

A. Project Overview

Project teams at Southwest Texas State University and the Pennsylvania State University developed the *Libra* authoring system to enable faculty to create multimedia lessons for foreign language listening comprehension. We had originally entered into an agreement with personnel at the US Naval academy to develop an IBM-compatible version of *Libra* at that institutions. After considerable delays in the development of the IBM-compatible version of the authoring system and several requests for no-cost extensions from the Fund for the Improvement of Postsecondary Education (FIPSE), we had to replace the personnel at that institution in June 1995 by personnel at the Pennsylvania State University. That group has now completed a Windows version of *Libra*.

We devoted the first year and a half to designing and developing the Macintosh version of the authoring system. We began the development process by having two nationally recognized consultants, Professors Janet Swaffar (the University of Texas at Austin) and John Underwood (Western Washington University) meet with all the project team members and discuss the specifications of the authoring system. After our initial discussions with the consultants, the project team members engaged in additional lengthy deliberations on the number of instructional components to be included in the authoring system and its over-

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all organization. This time was indeed well spent because the authoring system that emerged from the development process has the strongest instructional foundation and clearest pedagogical focus of all the authoring systems currently available in the profession. In fact, the *Instructional Basis of Libra* manual for our authoring system was selected to be reprinted as a feature article in the *IALL Journal of Language Learning Technology.* (Fischer, R. & Farris, M. [1995]. The Instructional Basis of *Libra. The IALL Journal of Language Learning Technologies, 28,* 15-46.)

Beginning in the second year of the project, we started demonstrating the preliminary version of the authoring system at professional meetings. These meetings included the annual meeting of the American Council on the Teaching of Foreign Languages (ACTFL), the Computer Assisted Language Instruction Consortium (CALICO), the South Central Association of Learning Laboratories, and the South Central Modern Language Association. These presentations proved useful not only to disseminate *Libra* to the foreign language teaching profession but also to recruit qualified participants for the faculty authoring workshops to be held in the following year.

In the third year of the project, we offered faculty authoring workshops at professional meetings and academic institutions across the country. Since this time, we have continued to offer faculty authoring workshops at a variety of professional meetings and academic institutions.

We evaluated the authoring system and lessons created by means of it at critical stages during the three years of the project. These evaluations included the consultants' initial assessment of *Libra*'s design, faculty users' views of *Libra*'s instructional purpose and ease-of-use, and measurements of the extent of the instructional effectiveness of student lessons in controlled experimental situations. Results of these evaluation studies provided substantial qualitative and quantitative evidence that *Libra* has had a significant impact on foreign language teaching and students' ability to understand the language they were studying.

B. Purpose

Computer-Assisted Language Learning (CALL) has become an integral part of the foreign language instruction but has not yet reached its full potential. Three essential reasons underlie the lack of sustained achievement of CALL programs. First, most programs do not have adequate instructional designs; some are designed as general drill-and-practice programs without any defined instructional focus, while others focus on a specific language learning skill but do not have a complete or coherent instructional framework. Second, for CALL programs to be useful in specific educational contexts, they need to be designed to apply directly to those contexts. Ready-to-use generic programs cannot adequately meet students' learning needs in individual academic contexts. Third, most foreign language faculty do not have the expertise, nor the time to gain the expertise, to write effective computer programs.

Authoring systems, which subsume many of the technical tasks associated with writing computer programs, offer promising approaches to courseware development. They allow faculty to create programs that apply directly to their own classes without having to spend long hours learning how to write computer code. We created *Libra* to enable faculty authors to develop multimedia lessons which focus on listening comprehension and which contain the pedagogical components necessary for students to acquire appropriate listening comprehension skills.

C. Background and Origins

We had received previous grants to develop computer-based language learning materials and to train high school teachers to develop drill-and-practice programs and to undertake preliminary investigation into multimedia lesson development. With the advent of the widespread availability of foreign language videodiscs and the need for a well designed multimedia authoring system, we realized that substantial grant funds would be necessary to support the development of such an authoring system. We had enjoyed the support of

the administration at our university, but we certainly understood that this kind of extensive development project could not be carried out with their support alone. It is for this reason that we approached FIPSE for funding. Once funded, we continued to enjoy the full financial and administrative cooperation of our university.

Because our university was essentially a Macintosh campus, we needed to secure the cooperation of other personnel to develop an IBM-compatible version of *Libra*. We selected personnel from the Naval Academy for this purpose because of their standing in the CALL profession, their development of an earlier authoring system for IBM-compatibles, and their interest in the pedagogical approach we had adopted for our authoring system. Unfortunately, the personnel at the Naval Academy were not able to complete the IBM-compatible version, and we finally had to cancel our cooperative agreement with the Naval Academy in March 1995 and entered into a new agreement with personnel at the Pennsylvania State University in June 1995. That project team completed the IBM-compatible version of *Libra* in August 1996, and we will hold our first joint Macintosh/IBM-compatible faculty authoring workshop in summer 1997.

D. Project Description

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authoring system, implementing that design on the computer, and constantly improving the program as we considered the inclusion of new authoring components. It is because of our careful consideration of the design and purpose of the authoring system in the beginning phases of its development that we were able to offer a unique contribution to the foreign language teaching profession. The product that eventually emerged from the development process has become a leading computer application in the field.

The authoring system consists of a series of templates for basic expository displays, four question formats (supported by student feedback), and several kinds of help displays such as scripts and dictionaries. Its authoring procedures allow faculty to create multimedia controls, dialog boxes, hyperactive text, response-sensitive lesson controls, and links to graphics, digitized audio, digitized video, and world wide web documents all in a "what-the-author-sees-is-what-the-student-gets" environment.

We produced and piloted three sets of multimedia lessons based on authentic video materials in French, German, and Spanish at our institution. Faculty at three other institutions produced and piloted additional lessons in French, German, and Spanish. Although technically not part of our project, two of these three faculty members had attended our first faculty authoring workshop at San Diego State University and used the lessons they developed in that workshop in classes at their home institutions.

We evaluated the authoring system and student lessons created by means of it. These evaluation projects are described in section E below.

We trained faculty from other institutions how to use *Libra* in faculty authoring workshops at Computer Assisted Language Learning Consortium (CALICO) annual meetings, the US Naval Academy, the Language Acquisition Resource Center (LARC) at San Diego State University, and Southwest Texas State University. More than 45 teachers, who had varying degrees of computer experience ranging from novice levels to expert levels, attended these workshops and developed lessons in Chinese, French, German, Russian, and Spanish.

E. Evaluation/Project Results

We completed extensive evaluation studies of 1) lessons made with the *Libra* authoring system and 2) the authoring system itself. The following reports describe analyses of both quantitative and qualitative date from evaluation studies in French and Spanish at Southwest Texas State University—a comprehensive regional university; Austin Community College—an open-admissions junior college; the University of California at San Diego—a major state-supported research university; and Northwestern University—a highly selective private university. All but German lessons developed at Southwest Texas State University had a significant impact on student learning. These German lessons, whose instructional design varied radically from our recommended guidelines, did not yield statistically significant resul . Following the individual evaluation reports on the *Libra* lessons below are two reports on the evaluation of the *Libra* authoring system itself.

Evaluation of the French lessons at Southwest Texas State University

The French lessons at Southwest Texas State University were evaluated to determine the effect of *Libra*'s recommended instructional design versus a more traditional instructional design. The French faculty author, Dr. Robert Fischer, developed two sets of interactive videodisc lessons, one reflecting *Libra*'s recommended design and the other reflecting the instructional design typically found in traditional listening comprehension programs. Both sets of lessons used the same videodisc material, *La Marée et ses secrets* 'The Tide and Its Secrets,' a five-episode mystery story set in France.

The first set of lessons included pre-listening advance organizers which 1) described the characters and the setting of the story, 2) depicted the narrative structure of the five individual episodes, and 3) presented the vocabulary items students needed to know in order to understand the video. Listening comprehension checks in the form of multiple-choice questions, checklist questions, and icon-sorting questions verified students' under-

standing of the text and guided them to develop their understanding at a general level of comprehension (macro-level text processing) and at more specific levels of comprehension (micro-level text processing). Help screens modeled the use of appropriate listening comprehension strategies and directed students' attention to salient portions of the video text. Other help devices included hyperactive video scripts of the story and a French-English dictionary.

The second set of lessons included a more traditional introduction to the story without the kinds of advance organizers described above. Multiple-choice listening comprehension questions verified students' understanding of the content of the story but did not explicitly guide them to process the video text in terms of macro- and micro-level text processing. Help screens prompted students to view the video again and directed their attention to relevant portions of the video text. These lessons also included the same video scripts of the story and the French-English dictionary.

Students in first-semester French classes were randomly assigned to experimental and control groups, controlling for the external variables of instructor and time of class meetings. Students in the experimental group used the first set of lessons, while students in the control group used the second set of lessons. Students in both groups used the programs in the department's media center. They completed a lesson every two weeks and, after each lesson, took a listening comprehension quiz in the classroom as part of their normal course work. The listening comprehension quiz consisted of having students watch the videotape version of the episode in question and then complete a free recall protocol, i.e., a detailed summary in their own words of what they understood. The free recall protocols were scored by means of a weighted proposition checklist which had been validated the preceding semester. The test scores were analyzed to examine performance differences between the two groups. An analysis of covariance model, in which the covariate was a pre-task listening comprehension free recall protocol on an independent video text, was

used to control for any pre-existing differences among students. Table I summarizes the results of this analysis.

Table I
Evaluation of French lessons at Southwest Texas State University—Analysis of Covariance of Free Recall Protocols

	Quiz 1	Quiz 2	Quiz 3	Quiz 4	Quiz 5
Experimental Group N = 35	69.368	78.496	64.364	44.114	58.248
Control Group N = 32	47.035	54.464	41.083	32.002	46.069
	F = 53.174*	F = 35.706*	F = 49.447*	F = 25.255*	F = 15.697*

*$p < .001$

The data in table I clearly reveal that students in the experimental group outperformed the students in the control group on the first free recall protocol and maintained their superior performance on all the remaining free recall protocols, all differences significant beyond .001. The students in the experimental group clearly understood much more of the video story than those in the control group.

Given the open-ended nature of free recall protocols, it is possible to suppose that the students in the experimental group achieved higher test scores because they wrote longer summaries of the story's episodes. To test this supposition, the number of words written by students in their free recall protocols were counted and analyzed. Table II summarizes these results.

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Table II
Evaluation of French lessons at Southwest Texas State University—Analysis of Covariance of Word Counts in Free Recall Protocols

	Quiz 1	Quiz 2	Quiz 3	Quiz 4	Quiz 5
Experimental Group N = 35	163.749	360.327	329.906	274.697	284.833
Control Group N = 32	165.423	343.487	318.636	274.111	302.699
	F = 0.024*	F = 0.407*	F = 0.132*	F = 0.000*	F = 0.537*

*not significant

As we see, the analysis did not reveal any significant differences in word counts between the groups. The superior performance of the students in the experimental group was due to the quality—not the quantity—of their writing.

The French lesson evaluation project also included the investigation of a more subtle effect of *Libra*'s recommended instructional design and confirmed one of the theoretical constructs of foreign language schema theory. Schema theory suggests that students whose foreign language proficiency is below the level required to process a text easily, or students who rely too heavily on the use of macro-level text processing strategies, run the risk of misinterpreting a text by imposing their own ideas on the meaning of the text at the expense of information presented in the text. To combat this danger, some schema theorists prescribe that students should be encouraged to use both macro- and micro-level text processing strategies in a "bi-directional" approach in which general information derived from the text (and from students' own background knowledge) and specific information actually presented in the text are used, alternatively, to develop an accurate understanding of its meaning.

To measure the effect of *Libra*'s recommended instructional design on students' use of both macro- and micro-level text processing strategies, the number of unsupported inferences in their free recall protocols were computed and compared between the groups. Unsupported inferences were operationally defined as those inferences which bore no rela-

tionship to the text or those which were contrary to the facts presented in the text. Table III summarizes these results.

Table III
Evaluation of French lessons at Southwest Texas State University—Analysis of Covariance of Unsupported Inferences in Free Recall Protocols

	Quiz 1	Quiz 2	Quiz 3	Quiz 4	Quiz 5
Experimental Group N = 35	1.161	1.347	0.865	0.466	0.299
Control Group N = 32	3.426	3.545	2.602	0.919	0.943
	F =33.354****	F=15.645****	F = 11.581***	F =2.636*	F = 4.567**

*not significant
**p < .05
***p < .01
****p < .001

As we see, students in the experimental group made significantly fewer unsupported inferences than those in the control group. *Libra*'s recommended instructional design had a clear impact on students' inferencing accuracy by helping them to avoid unfounded interpretation errors, confirming schema theory's prescription of bi-directional text processing.

Taken altogether, these three analyses show that the instructional design of the French *Libra* lessons had a substantial and pervasive impact on students' listening comprehension proficiency. The experimental group students outperformed the control group students on every measure taken in the evaluation process: they understood significantly more of the video material, wrote higher quality free recall protocols, and made fewer interpretation errors.

Evaluation of the Spanish lessons at Southwest Texas State University

The evaluation of the Spanish *Libra* lessons at Southwest Texas State University followed a different assessment strategy to provide a second dimension to *Libra*'s overall

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evaluation. Our purpose here was to determine the effect of the method of delivery of the video material: interactive videodisc versus linear videotape. The Spanish faculty author, Dr. James Champion, developed two sets of five listening comprehension lessons, one set using a videodisc version of *Zarabanda: The Adventures of Ramiro* and the other a videotape version of the same material. Similar to the French lessons, the instructional design of the Spanish interactive videodisc lessons included advance organizers focusing on the characters of the story, its setting, and the narrative structure of the individual episodes. Listening comprehension checks in the form of multiple-choice questions, checklist questions, and icon-sorting questions verified students' understanding at both the macro- and micro-levels of text processing. Help screens displayed diagnostic prompts directing students to salient portions of the video text and were further supplemented by a hyperactive video script and a Spanish-English dictionary. Dr. Champion then replicated this instructional design in paper form for use with a videotape version of the same video episodes.

Students in first-semester Spanish classes were randomly assigned to experimental and control groups, controlling for the time of class meetings. (All classes were taught by the same instructor, obviating the need to control for the instructor variable.) Students in the experimental group used the interactive videodisc lessons, while students in the control group used the linear videotape lessons. As in the French evaluation project, both groups used the lessons in the department's media center, completing a lesson every two weeks and taking a free recall protocol quiz after each lesson. Students' quizzes were scored by means of weighted proposition checklists, and their test scores were analyzed to compare performance differences between the groups. Again, an analysis of covariance model was used to control for any pre-existing differences among students. Table IV displays the results of this analysis.

Table IV
Evaluation of Spanish lessons at Southwest Texas State University—Analysis of Covariance of Free Recall Protocols

	Quiz 1	Quiz 2	Quiz 3	Quiz 4	Quiz 5
Experimental Group N = 25	47.675	47.180	51.669	47.445	41.979
Control Group N = 30	45.886	49.732	43.776	39.028	32.484
	F = 0.290*	F = 0.610*	F = 5.732**	F = 8.644***	F =17.828****

*not significant
**p < .05
***p < .005
****p < .001

As can be seen in these data, the analysis showed no significant differences in students' test scores between the experimental and control groups for the first two free recall protocols. However by the time of the third quiz, students in the experimental group began to outperform those in the control group and maintained their advantage over the two remaining quizzes. As a partial explanation for the lack of significant differences in the first two free recall protocols, Dr. Champion suggested that not all students in the experimental group were initially aware of all the help screens and other pedagogical devices in the interactive videodisc lessons. Apparently when they discovered the availability of these features, they began to outperform the students in the control group. These data offer solid empirical evidence that—by the mid-point of the Spanish evaluation project—the videodisc lessons' inherent interactivity, their immediate feedback to students' responses, and the help screens' prompts and messages had a significant and lasting impact on student's listening comprehension proficiency.

Evaluation of student attitudes toward using the French and Spanish *Libra* lessons

We collected data about students' attitudes toward using the French and Spanish *Libra* lessons to provide a third dimension to our overall evaluation. We asked students for their views on using interactive video technology for language learning purposes and the

pedagogical effectiveness of the lessons in written questionnaires at the end of the two evaluation projects. All of the students stated that they enjoyed using the lessons, and more than 75% declared that the lessons helped them to improve their ability to understand spoken language. Of special interest was the change in students' attitudes toward using the technology over the course of the two projects, as indicated by their responses to the French and Spanish questionnaire items below.

French questionnaire item number two:

Before using the interactive video French lessons, my attitude toward using computers to learn a foreign language was

	hostile	fearful	indifferent	curious	enthusiastic
Experimental Group	0%	4%	32%	50%	14%
Control Group	0%	9%	32%	41%	18%

French questionnaire item number three:

After using the interactive video French lessons, my attitude toward using computers to learn a foreign language is

	hostile	fearful	indifferent	curious	enthusiastic
Experimental Group	0%	0%	28%	14%	58%
Control Group	0%	0%	20%	28%	52%

Spanish questionnaire item number two:

Before using the interactive videodisc Spanish lessons (experimental group)/linear videotape Spanish lessons (control group), my attitude toward using computers/VCR's to learn a foreign language was

	hostile	fearful	indifferent	curious	enthusiastic
Experimental Group (interactive videodisc)	0%	0%	25%	63%	12%
Control Group (linear videotape)	0%	7%	76%	10%	7%

Spanish questionnaire item number three:

After using the interactive videodisc Spanish lessons (experimental group)/linear videotape Spanish lessons (control group), my attitude toward using computers/VCR's to learn a foreign language is

	hostile	fearful	indifferent	curious	enthusiastic
Experimental Group (interactive videodisc)	0%	0%	16%	30%	54%
Control Group (linear videotape)	0%	3%	38%	35%	24%

Comparison of students' pre- and post-project attitudes shows a dramatic positive shift. Over 50% the students selected the highest rating on the five-point scale, describing themselves as "enthusiastic" about using the *Libra* lessons. These attitudinal changes, combined with the fact that *Libra*'s recommended instructional design significantly improved listening comprehension proficiency, indicates that broad-based use of high-quality interactive videodisc lessons will have a substantial effect on student learning.

Evaluation of Spanish *Libra* lessons at Austin Community College

The Spanish *Libra* lessons were also evaluated at Austin Community College, an open admissions junior college in Austin, Texas. The purpose of the evaluation process at this institution was similar to the one at Southwest Texas State University: to determine the relative effect of interactive videodisc versus linear videotape lessons of *Zarabanda* with a student population different from that of Southwest Texas State University.

As before, first-semester Spanish students were randomly assigned to experimental and control groups. The experimental group students used the interactive videodisc lessons, students in the control group used the linear videotape lessons, and students in both groups completed the lessons in the instructor's office. Immediately after completing each lesson, students completed free recall protocols which were scored by means of a weighted proposition checklist. Table V summarizes these results.

Table V
Evaluation of Spanish lessons at Austin Community College—Analysis of Variance of Free Recall Protocols

	Quiz 1	Quiz 2	Quiz 3	Quiz 4
Experimental Group N = 15	41.600	45.870	34.800	40.810
Control Group N = 14	24.790	30.140	24.500	27.070
	F = 27.018**	F =19.639**	F = 13.280*	F = 22.288**

*p < .005
**p < .001

From these data, we see that the students in the experimental group outperformed those in the control group on all quizzes. The use of the interactive videodisc version of the lessons had a significant impact on the junior college students' learning.

Evaluation of a French *Libra* lesson at the University of California at San Diego

A French *Libra*-lesson, developed by two participants from the University of California at San Diego in one of our faculty training workshops, was evaluated with students at that institution. Nine students enrolled in a special intensive summer program in French used the lesson, which was based on a short authentic video segment taken from French television, as an adjunct to their classroom instruction. The lesson essentially consisted of an advance organizer focusing on the narrative structure of the video segment and questions verifying students' comprehension (multiple-choice, checklist, and icon-sorting questions). Help screens displayed prompts, diagnostic messages, and a hyperactive video script. After completing the lesson, students specified the degree to which their understanding of the video text increased from initial viewing to final viewing—after answering the comprehension questions and using the lesson's pedagogical features—on a six-point scale ranging from understanding "practically none" of the text to "all of [the text]." Students' understanding increased from a mean of 2.89 to 5.00, understanding "almost all of [the text]," which represents an increase of 73%. The project was repeated with students enrolled in

regular French classes in spring 1994 with similar results (N = 38). Students' comprehension levels increased from a mean of 2.76 to 5.13, an increase of 86%.

Evaluation of German *Libra* lessons at Northwestern University

Another workshop participant developed and evaluated *Libra* lessons in a large second-year German program at Northwestern University (N = 188). These lessons contained a number of instructional features including a map of part of Germany with hyperactive features, a variety of listening comprehension questions, contextual help displays, German and English subtitles, and a dictionary. The intermediate German students used the lessons as part of their regular course work and completed an anonymous evaluation questionnaire. More than 85% of the students reported that their overall German language skills improved as a result of using the lessons, especially in listening comprehension (92%). Over 90% of the students found the computer lessons more helpful than conventional laboratory materials. Individual students commented positively on the fundamental interactivity of the lessons with the video, the immediate feedback to their answers to comprehension questions, and the individualized nature of the learning.

Evaluation of the *Libra* authoring system

We also evaluated the *Libra* authoring system itself to assess its ease of use and instructional value. A total of 60 foreign language educators, whose computer experience ranged from "novice" to "expert," evaluated the authoring system in a detailed written questionnaire.

We requested 14 foreign language educators, experienced computer users to whom we had distributed a pre-release version of *Libra*, to complete the evaluation questionnaire. We also gave three one-week *Libra* training workshops to 46 foreign language teachers, who had varying degrees of computer experience, and requested that they complete the same questionnaire. The workshop participants ranged from a middle school teacher through graduate level faculty members in six foreign languages from English as a Second

Language to Chinese. All 60 respondents rated *Libra*'s authoring tools very favorably. They rated the appearance and screen layout of the authoring environment as "good" and the general value of the stacks, cards, and other objects as "useful" and "easy to work with." Their general ratings of *Libra* as a whole, as the summary below reveals, are very high.

1. To what degree is *Libra* easy to learn?

very hard to learn									very easy to learn
1	2	3	4	5	6	7	8	9	10

mean: 8.08
S.D.: 1.56

2. To what degree is *Libra* easy to use?

very hard to use									very easy to use
1	2	3	4	5	6	7	8	9	10

mean: 8.18
S.D.: 1.29

3. To what degree does *Libra* meet your needs?

does not meet needs									fully meets needs
1	2	3	4	5	6	7	8	9	10

mean: 7.80
S.D.: 1.53

The means of the responses to all three items cluster tightly around eight on a scale of ten. These ratings are particularly significant since they represent the views of both experienced and inexperienced computer users teaching a variety of foreign languages at different levels of instruction. Individual workshop participants' comments provide further evidence of the *Libra*'s value.

- "*Libra* has made working with multimedia on interactive videodisc technology easier than ever! I felt a lot more confidence with this program than with any other authoring program I have used. When I return to my university, I plan to share/teach the program to others, and I feel that they will be even more willing to pursue this new tool than ever before."—Linda Jones, University of Arkansas, Fayetteville, Arkansas

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- "As a trainer, I believe that *Libra* will be an excellent tool for our faculty wishing to develop interactive lessons. Of the programs I have worked with, *Libra* appears to have combined the best of all worlds—making development easier for the novice (which is what we need!)."—Toni Larson de Aguilar, Willamette University, Salem, Oregon

- "Besides the fact that *Libra* is easy to learn for faculty with limited knowledge of programming, it can be adapted to different languages, and lessons can be manipulated in a number of ways for different pedagogical purposes."—David Wolfe, Moorestown Public Schools, New Jersey

- "Although I have never used a Macintosh computer before, I found the machine and *Libra* extremely easy to use. Lots of great features. I look forward to seeing new versions with additional features."—N. Patricia Duggar, Paul Breaux Middle School, Lafayette, Louisiana

- "*Libra* offers tremendous support in creating materials for authentic videos such as found in *Spanish-TV Magazine*."—Alan Bell, University of Maryland-Baltimore County, Baltimore, Maryland

In addition, the staff at the Language Acquisition Resource Center at San Diego State University did an independent evaluation of the *Libra* workshop conducted there. They asked participants to rate the workshop by responding to questionnaire items on a five-point scale, ranging from "poor/useless" to "excellent." The items below pertain specifically to the quality of the *Libra* authoring system and the quality of instruction provided by the project team (N = 14).

1. Usefulness of ideas and information presented

poor/useless				excellent
1	2	3	4	5

mean: 4.7
S.D.: .61

2. Clarity of instructions

poor/useless				excellent
1	2	3	4	5

mean: 4.5
S.D.: .76

3. Usefulness of supporting materials

poor/useless				excellent
1	2	3	4	5

mean: 4.5
S.D.: .65

4. Helpfulness of staff

poor/useless				excellent
1	2	3	4	5

mean: 4.9
S.D.: .65

Again, as these figures show, the means of the participants' responses are very high, ranging from 4.5 to 4.9 on the five-point scale. They corroborate our own evaluation results and extend them to include the quality of instruction offered by the project team personnel.

Taken altogether, the evaluation studies completed during the three-year period of the project showed that the *Libra* authoring system enabled faculty to create high quality computer lessons and that well designed *Libra* lessons significantly facilitated students' acquisition of listening comprehension proficiency.

F. Summary and Conclusions

Our project has provided, we believe, substantial benefits to the foreign language teaching profession and certainly to our project team. *Libra* has proven to be an important

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computer application in the profession as evidenced by the number of inquiries and requests for workshops we continue to receive. The members of our project team have also grown professionally as a result of their participation in the project. Our collaborative projects and other contacts with other institutions have allowed us to gain greater insights into the academic contexts of those institutions and has given us a broader perspective in which to understand our own institution.

In summary, although the project required far greater effort and closer coordination of project activities than originally anticipated—especially with other institutions, we have brought the project to very successful conclusion. We are continuing to use *Libra* at our institution and have in fact developed over 50 lessons in French. Those lessons form the cornerstone of our whole instructional program in that language. We are also continuing to disseminate *Libra* in presentations at professional meetings, faculty authoring workshops across the US, and collaborative projects with colleagues at other universities.

Appendix A

Fischer, R. & Farris, M. [1995]. The Instructional Basis of *Libra*. *The IALL Journal of Language Learning Technologies*, *28*, 15-46.

Instructional Basis of *Libra*

by Robert Fischer and Michael Farris
Southwest Texas State University

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Introduction

Over the past fifteen years foreign language listening comprehension has become an increasingly important component in language instruction, especially in the beginning stages of language acquisition. Even a cursory review of the literature on foreign language education shows widespread discussion of the importance of listening comprehension proficiency as an early objective in a variety of language curricula.[1] For example, advocates of the comprehension approach to language acquisition posit that listening comprehension is the primary mechanism by which learners acquire competency in the foreign language. Comprehensible input, both oral and written, are basic constructs within Krashen's Monitor Model. Comprehensible input and the i + 1 net have formed the basis of numerous studies on the role of listening comprehension. Proficiency oriented teaching, originally focused on the assessment of speaking proficiency, now includes a listening comprehension proficiency scale. Other more recently formulated approaches to language teaching depend extensively on understanding and reacting to authentic texts as the basis for classroom instruction.[2]

Interactive videodisc (IAV) programs offer significant advantages over more traditional audio programs towards the goal of helping students to develop listening comprehension proficiency. As more and more institutions acquire computer hardware and software, it can be expected that IAV programs will play an even more substantial role in foreign language instruction in the future.[3] IAV programs provide highly individualized instructional programs in which the computer functions as a patient tutor and guide under students' immediate control. The computer permits instantaneous access to precisely defined video sequences to focus students' attention on specific linguistic expressions and salient contextual

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features. The inclusion of questions and comprehension checks in IAV software programs, supported by appropriate feedback, prompts, and other pedagogical features, assures students' consistent interactivity with the video material. The use of on line help devices such as scripts, dictionaries, grammatical explanations, cultural notes, graphic displays, and digitized audio files adds considerably to the quality of the learning environment for students. For these reasons, and others which will be presented below, well designed IAV programs represent one of the most effective ways to facilitate students' development of listening comprehension proficiency.

Research Base

Current views of foreign language listening comprehension have evolved considerably from earlier conceptions in which students were assumed to be passive recipients of linguistic messages or at best decoders of surface level syntactic structures. Advances made by discourse processing theory in native language comprehension and by schema theory in second language comprehension have added new perspectives in which to view listening comprehension processes. Far from being a passive or low level decoding skill, listening comprehension involves the active use of a flexible set of cognitive processing strategies which enable listeners to construct a personally meaningful mental representation of their understanding of a linguistic text.

Anderson 1990 provides a general cognitive framework of listening comprehension processes. This framework includes three interrelated levels of processing strategies: low level perception-segmentation strategies, intermediate level parsing strategies, and high level utilization strategies.[4] Perception-segmentation strategies are the processing strategies necessary to enable listeners to segment the speech signal into words and other morpho-syntactic units.[5] To help students to acquire these skills, foreign language teachers have become accustomed to doing classroom exercises which require students to attend to individual words or expressions in phrases or to identify grammatical markers, such as plural noun markers or verbal tense markers, in isolated sentences. Virtually all text book audio programs include discrete-point aural discrimination tasks which test students' ability to identify specific surface structure forms.

Parsing strategies involve assigning syntactic roles to sentence constituents such as subject, verb, and object. This process operates on sentence structures above the level of individual words and leads to semantic representations in

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which the functional roles of sentence constituents are clearly specified. While most foreign language students do not normally experience persistent problems in developing perception-segmentation strategies, some may have considerable difficulty reaching this intermediate level of sentence parsing because they tend to remain focused on individual words.[6] If students are to develop effective listening comprehension strategies and to reach higher levels of text processing, they will of course need to be able to progress from identifying individual words in concrete phrases to processing sentences in terms of their constituent structure.[7]

Utilization strategies involve relating information that comprehenders derive from linguistic texts to knowledge they have previously acquired and stored in long-term memory. It is at this level of text processing that discourse processing theory and schema theory have made their greatest contributions to understanding listening comprehension processes.

The fundamental principle of discourse processing theory posits that comprehenders actively construct a mental representation of their understanding of a linguistic text. The construction of this mental representation depends not only on information extracted from the linguistic text but also on prior knowledge of the situation described in the text and other general knowledge.[8] Comprehenders initially encode information extracted from the linguistic text in the form of the semantic representations described above, commonly called micro-propositions in discourse processing theory. As they process successive sentences in the text, they begin to conjoin points of information contained of individual micro-propositions into more inclusive macro-propositions. They continue this process by progressively integrating information from these macro-propositions into yet more inclusive macro-propositions until they arrive ultimately at a representation of the overall theme or gist of the complete text. For example, suppose a text contains an episode describing someone's taking a trip by plane.[9] The description in the text may specify numerous details about the trip such as driving to the airport, finding a parking place, parking the car, walking to the terminal, checking luggage in, getting a boarding pass, waiting in the gate area, boarding the plane, etc. As comprehenders process the text, they integrate individual micro-propositions (e.g., driving to the airport, finding a parking place, parking the car) into a more general macro-proposition (e.g., getting to the airport). During subsequent textual processing, this macro-proposition is integrated with other macro-propositions resulting in a single, much more abstract macro-propo-

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sition representing this episode of the individual's airplane trip.

Prior to arriving at a single representation of the meaning of a whole text, comprehenders gradually build their understanding of the text's meaning by relating macro-propositions which correspond to their perceptions of the episodes of the text to each other in some meaningful pattern. Their recognition of the causal relationships or other logical connections among these macro-propositions is essential for the construction of a coherent mental representation, and the conceptual framework that comprehenders develop as they proceed through the text forms the basis of their view of its internal cohesiveness. Thus the reader of the story containing the description of the airplane trip above will relate that episode to other episodes in the story to form an overview of the story's plot and thematic structure.

Different kinds of texts will of course exhibit different configurations of narrative structures. For example, descriptions normally portray the object or person being described as the primary narrative focus of the text and then list several characteristic features of that object or person. However advertisements for commercial products usually show cause and effect relationships (albeit sometimes specious ones) between the use of the product and some desired result.[10] Although it may be difficult to predict the precise narrative structure of text genres, it remains clear that comprehenders' ability to perceive logical relationships among the text's components underlies higher level text processing.

As students' tendency to retain their focus on concrete words and phrases hampers their ability to use effective parsing strategies, so does it interfere with their ability to proceed to the next higher level of text processing to relate textual components to each other. Students who are not able to progress to this level of text processing generally have a disorganized or fragmented view of the text's meaning. It is in fact at this level that foreign language students' failures to understand a text are frequently made manifest. Their efforts are often characterized by an ability to understand isolated words and phrases but an inability to fit these pieces of information together in a rational manner. If foreign language students are to develop a meaningful and coherent mental model of the text's meaning as a whole, many of them will need explicit guidance to fit textual macro-structures together in a logical pattern. In simpler or straightforward narratives it is probably sufficient to remind students to pay attention to the plot line of the story. In more complex narrative structures it may

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be necessary to call students' attention to specific segments in the story and to point out their logical relationship to the overall structure of the text.

As comprehenders process information from the text, the construction of their mental representation of its meaning is an on-going, dynamic process. They evaluate the importance of new textual information on the basis of its relevance to information already processed and stored in their mental representation. If the new information is judged to be useful to the development of their understanding of the text, they will integrate that information with information already included in their mental model and update it accordingly. New information which is not judged to be sufficiently important is not normally processed into the mental representation. It is for this reason that unimportant textual details are not recoded for storage in long-term memory and therefore forgotten. In addition as comprehenders' understanding of the text evolves, less important previously processed information may lose its value as primary information in the mental representation and be subsumed under more general memory structures or perhaps eventually lost from memory altogether.[11] What comprehenders generally retain in long-term memory is a representation of their understanding of the general message of a text supported by salient details which reinforce that message.

The development of comprehenders' understanding of a text entails not only processing information from lower levels to build mental structures at higher levels but also using information from higher levels to facilitate their interpretation of information at lower levels. For example, comprehenders routinely identify words at the perception-segmentation level in order to parse sentences at the next higher level of text processing. Conversely they may also use their knowledge of the syntactic structure of a sentence at the parsing level to identify individual words at the lower level. Of particular interest here is comprehenders' ability to use higher order knowledge to assess the relevance of new information they encounter in a text. Information already stored in their mental model and other general knowledge lead comprehenders to expect certain kinds of events in specific contexts. These expectations allow them then to anticipate events in the situation described in the text and facilitate their processing of new information consistent with these expectations. The interplay between using strategies from lower levels to support processing at higher levels and using knowledge from higher levels to facilitate processing at lower levels forms

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the cornerstone of what is commonly called macro-/micro-level processing or top-down/bottom-up processing. Several studies have clearly shown that such bidirectional processing plays a critically important role in the development of understanding of a linguistic text.

Foreign language schema theorists emphasize the use of previously acquired knowledge in top-down information processing. Previously acquired knowledge is normally defined to include knowledge of common communicative or social situations stored in memory as scripts or schemata, other general knowledge of the world, and perhaps knowledge of the narrative structure of specific text genres.[12] Comprehenders' prior knowledge is said to be "instantiated" during the initial stages of text processing, that is, information mentioned early in the text is thought to activate their knowledge relevant to the situation in question. Once activated, comprehenders then have access to this knowledge to help them to process information from the text and to construct a rich mental representation of the text's meaning replete with their own inferences about it.

Although the top-down approach to text comprehension has attracted considerable attention, a word of caution about relying too much on its use in instructional settings is warranted. The exclusive use of top-down processing in listening comprehension tasks may well lead to substantial errors in students' understanding of a text. Students who adhere too strictly to top-down processing run the risk of disregarding text-based information and imposing their own views too liberally on the text. Their resulting mental representation of the text's meaning will likely be highly idiosyncratic and contain distorted impressions of the text along with numerous unfounded inferences about its meaning. The more balanced bidirectional approach advocated here prescribes that students should use top-down and bottom-up processing strategies. Students should be encouraged to use both previously acquired knowledge and information derived from the text to develop an accurate view of its meaning. While most native speakers automatically employ appropriate top-down and bottom-up strategies, foreign language students, especially those whose language proficiency is insufficient for the level of linguistic difficulty of a text, tend to adopt one set of strategies over the other and to use those strategies too rigidly in comprehension tasks.[13] Successful foreign language comprehenders must be able to make use of both sets of processing strategies, and most foreign language students need explicit guidance to use them effectively.

To activate students' pertinent prior knowledge, schema

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theorists recommend the use of advance organizers, i.e., instructional techniques which prepare students for upcoming listening tasks. They have proposed various kinds and combinations of advance organizers including pictures or other descriptions of the communicative situation depicted in the text, preteaching selected vocabulary items, or previewing the text's narrative structure.[14] Of these techniques, the use of pictures appears to offer an effective way to evoke students' background knowledge about the topic of communication. In addition arranging pictures in spatial relationships which reflect the narrative structure of the text not serves to only activate students' background knowledge but also to prepare them to process the text in terms of its own internal organization.[15] Such schematic displays of the text's components identifies the text's major episodes for students and suggests the logical connections that hold among them. They enable students to follow the thread of discourse in the text and facilitate macro-level processing by encouraging students to view the text's components in relation to each other.[16]

Research in native language discourse processing theory and foreign language schema theory holds numerous implications for the design of IAV programs. Several general principles emerge from the discussion here and form a relatively clear set of instructional principles. IAV materials developers would be well advised to take these principles into account in the preparation of listening comprehension materials.

1. Comprehenders actively construct a mental representation of their understanding of a linguistic text.
2. The construction of comprehenders' mental representations involves the use of previously acquired knowledge and information derived from the linguistic text, including visual images in video texts.
3. Comprehenders derive information from linguistic texts by means of a set of processing strategies which include perceptual-segmentation strategies, sentence parsing strategies, and higher order utilization strategies.

a. Comprehenders' identification of functional relationships among sentence constituents is necessary for building individual micro-propositions.

b. Comprehenders' integration of individual micro-propositions into more inclusive macro-propositions is essential for higher level text processing.

c. Comprehenders' perception of logical relationships among a text's components underlies the construction of coherent mental representations.

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4. Comprehenders use textual information to update their mental representation and information in their mental representation to interpret new textual information.

5. Effective comprehenders make flexible use of bidirectional processing strategies as they develop an understanding of a linguistic text.

6. Advance organizers play a critical role in instantiating students' relevant background knowledge.

a. The use of visual cues in schematic displays which reflect the logical structure of a linguistic text facilitates students' use of higher level comprehension strategies.

Instructional Design Issues

If one of the goals of interactive video program development is to create lessons which help students' to develop foreign language listening proficiency, then lessons in which the instructional design reflects the principles of discourse processing theory and schema theory will allow them to make substantial progress towards this goal. *Libra* enables faculty-authors to create lessons which closely model the listening comprehension strategies listed above and to guide students in their appropriate use. It contains all the tools necessary to develop effective instructional designs and to direct students to process linguistic texts in specific, user-definable ways. The examples below, created by means of *Libra*'s tools, illustrate some of the ways in which the authoring system can be used to create pedagogically sound IAV programs.

Advance Organizers

Advance organizers instantiate students' relevant background knowledge which in turn facilitates their construction of a meaningful mental representation of the text's meaning. *Libra* contains a number of authoring devices to create a different kinds of advance organizers. For example, *Libra*'s text tools allow lesson authors to enter information in displays to introduce the story to students. The example below, the initial display in a lesson on the Spanish program, *Zarabanda: The Adventures of Ramiro*, is designed to give students a general introduction to the video series.

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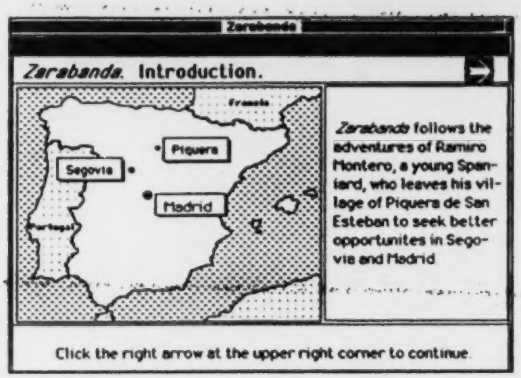
Zarabanda
Zarabanda. Introduction.
Segovia
Piquera
Madrid
Zarabanda follows the adventures of Ramiro Montero, a young Spaniard, who leaves his village of Piquera de San Esteban to seek better opportunites in Segovia and Madrid
Click the right arrow at the upper right corner to continue.

Figure 1
Introductory Display for Zarabanda

Libra's icon button tools can be used to make iconic representations of characters and to present their interrelationships. The display below shows icon buttons representing the main characters of the first episode of *Zarabanda*.

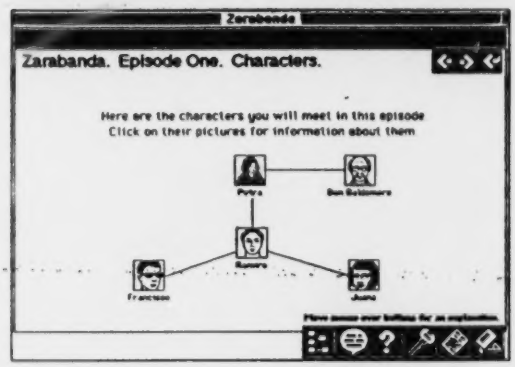
Zarabanda
Zarabanda. Episode One. Characters.
Here are the characters you will meet in this episode
Click on their pictures for information about them

Figure 2a
Character Display for Zarabanda

The configuration of icon buttons surrounding the one representing Ramiro, the main character in the story, and the lines connecting the icon buttons to each other are designed to reveal the characters' relationship to the protagonist. The program instructs students to click the icon buttons to obtain information about the characters. Each icon button is linked to a small display which describes the character in more detail and allows students to see a picture of the character in the context of the story.

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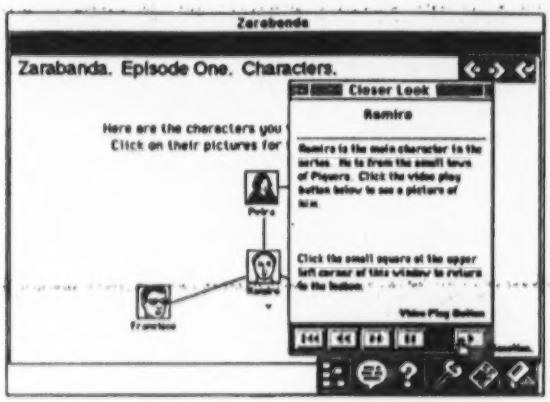

Figure 2b
Character Display for
Zarabanda

Presenting information about the setting of the story also helps to prepare students to view the video program. The series of displays below, taken from a program developed for the French program, *La Marée et ses secrets* 'The Tide and its Secrets,' describes the geographical location of the story.

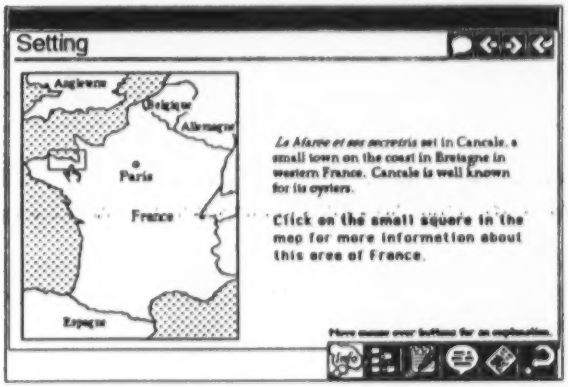
Setting
Angleterre
Belgique
Allemagne
Paris
France
Espagne
La Marée et ses secrets set in Cancale, a small town on the coast in Bretagne in western France. Cancale is well known for its oysters.
Click on the small square in the map for more information about this area of France.

Figure 3a
Setting Display for
La Marée et ses secrets

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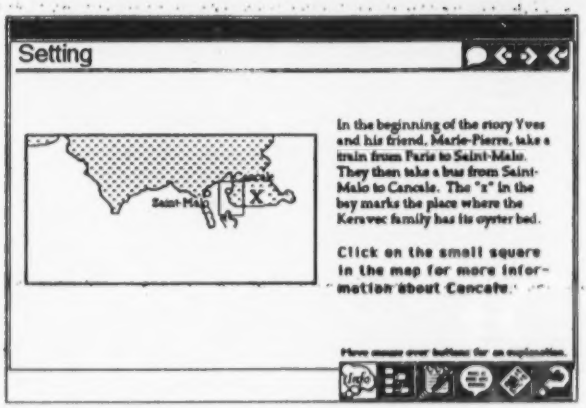
Setting
Saint-Malo
Cancale
In the beginning of the story Yves and his friend, Marie-Pierre, take a train from Paris to Saint-Malo. They then take a bus from Saint-Malo to Cancale. The "x" in the bay marks the place where the Kerevec family has its oyster bed.
Click on the small square in the map for more information about Cancale.

Figure 3b
Setting Display for
La Marée et ses secrets

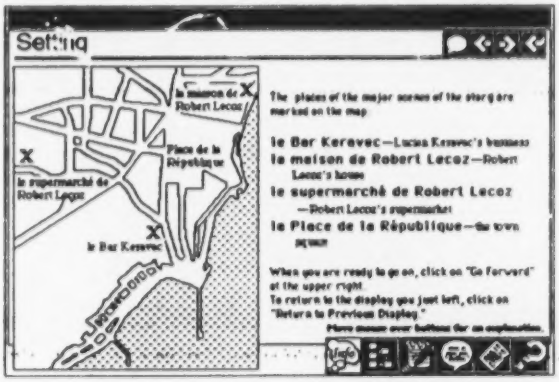
Setting
la maison de Robert Lecoz
Place de la République
le supermarché de Robert Lecoz
le Bar Kerevec
le Bar Kerevec—Lucas Kerevec's business
la maison de Robert Lecoz—Robert Lecoz's house
le supermarché de Robert Lecoz
—Robert Lecoz's supermarket
le Place de la République—the town square
When you are ready to go on, click on "Go Forward" at the upper right.
To return to the display you just left, click on "Return to Previous Display."

Figure 3c
Setting Display for La
Marée et ses secrets

These introductory displays familiarize students with the setting of the story and parallel the opening scenes of the first episode of the story in which two people travel from Paris to the small town of Cancale on the Brittany coast. They show an initial large scale perspective of the seaside location of Cancale and progressively narrow students' focus to the actual locations in the town where the action of the story takes place.

Schematic displays of pictorial cues which reveal the narrative structure of a text facilitate students' use of higher level cognitive strategies. Such displays help students to relate the text's components to each other to form a coherent overview of the story. *Libra*'s icon button tools can be used to create icon buttons representing the events in a text and to arrange

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them in patterns reflecting the text's narrative structure. The display below, taken from the first lesson on *La Marée et ses secrets*, shows a detailed view of a relatively simple plot outline.

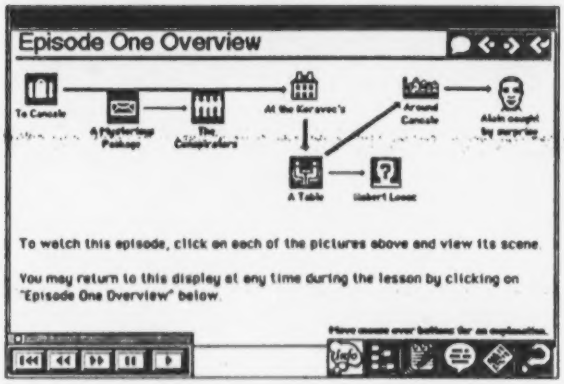
Episode One Overview
To watch this episode, click on each of the pictures above and view its scene.
You may return to this display at any time during the lesson by clicking on "Episode One Overview" below.

Figure 4
Text Map for La Marée et ses secrets

This display shows the five major scenes which carry the primary action of the story and three minor scenes which function as narrative asides. Students may choose to view the entire episode by clicking the video buttons at the bottom left corner of the display or individual scenes by clicking the icon buttons representing those scenes. *Libra*'s tools enable faculty-authors to create text maps which portray linear plot progressions, causal chains linking one event to another, hierarchical arrangements for descriptions of objects or people, and other kinds of narrative structures.

Linguistic advance organizers can be presented to underscore key information in the story that students need to know but may not be able to separate from less important details or to prepare students to handle other expressions that may be hard to understand. *Libra*'s tools can be used to create hyperactive text displays linked to a variety of explanatory devices such as videodisc events or digitized audio files. The display below contains hyperactive text linked to the videodisc of *La Marée et ses secrets*. Students may click the underlined expressions to hear them as they are spoken in the video scene and replay them as many times as necessary. Previewing the expressions in this manner helps students to understand them when they hear them in the video scene.

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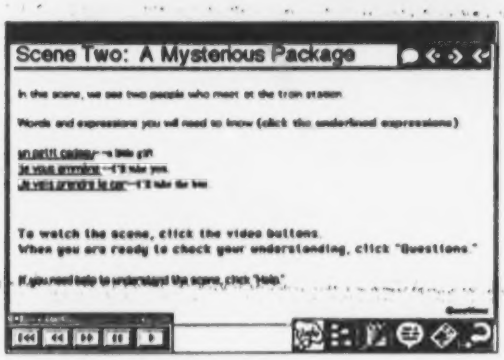
Scene Two: A Mysterious Package
To watch the scene, click the video buttons.
When you are ready to check your understanding, click "Questions."

Figure 5
Linguistic Advance Organizer Display for La Marée et ses secrets

Macro-/Micro Level Comprehension

Effective comprehenders use flexible comprehension strategies at several levels of text processing to develop an understanding of a text, and foreign language students need explicit guidance in the use of these strategies. The instructional design of IAV lessons should direct students to attend both to developing their general understanding of the text and to processing specific information from the text.

Libra provides authoring tools to create five different kinds of comprehension checks to guide students in the use of macro- and micro-level comprehension strategies. It contains templates for multiple-choice questions, checklist questions, binary checklist questions, icon sorting questions, and open-response questions. All of the question formats lend themselves equally well to verifying students' understanding of both general and specific information. For example, the multiple-choice question format can be used to confirm students' comprehension of the primary message of a video scene and also the textual details which support that message. The two sample questions below illustrate the macro- and micro-level functions of the multiple choice question format.

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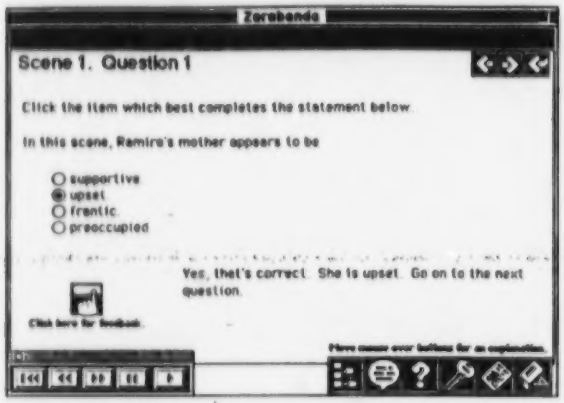
Zarabanda
Scene 1. Question 1
Click the item which best completes the statement below.
In this scene, Ramiro's mother appears to be
supportive
upset
frantic
preoccupied
Yes, that's correct. She is upset. Go on to the next question.

Figure 6a
Macro-Level Multiple Choice Question for Zarabanda

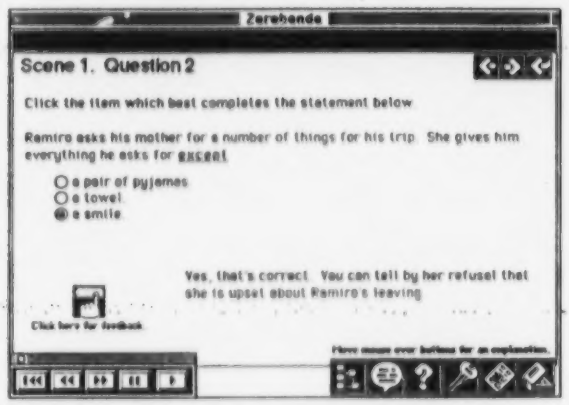
Zarabanda
Scene 1. Question 2
Click the item which best completes the statement below.
Ramiro asks his mother for a number of things for his trip. She gives him everything he asks for except
a pair of pyjamas
a towel
a smile
Yes, that's correct. You can tell by her refusal that she is upset about Ramiro's leaving.

Figure 6b
Micro-Level Multiple Choice Question for Zarabanda

These questions are taken from a scene in *Zarabanda* in which Ramiro makes plans to leave his small village for the big city. As Ramiro prepares to leave, his mother indirectly expresses her displeasure at his imminent departure by means of gestures and facial expressions. The first question above, the macro-level question on this scene, focuses students' attention on the mother's reaction to her son's plans. After students correctly answer this question that Ramiro's mother is upset, the program presents the second question, a micro-level question, on the important detail of this scene. This question calls students' attention to the specific information which carries the primary message of the scene. As Ramiro asks his

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mother for items he needs for his trip, she gives him everything he requests except a smile he asks for in an effort to cheer her up.

The checklist question format can be used for the purpose of verifying macro- and micro-level information in situations in which more than one piece of information is required. For example, the question below, taken from the German detective story, *Die Dame aus Amsterdam* 'The Woman from Amsterdam,' guides students to observe the secretive actions of a character in a hotel lobby scene.

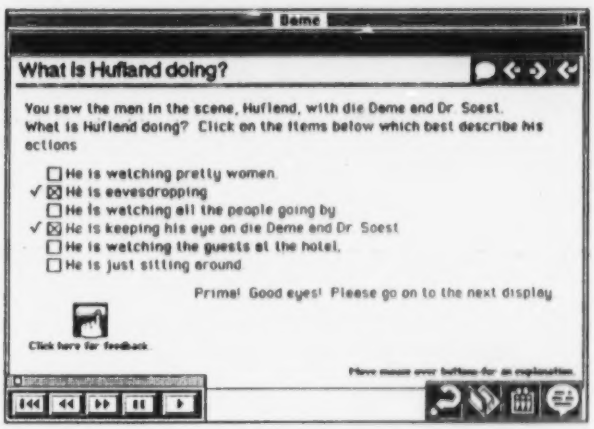
Dame
What is Hufland doing?
You saw the men in the scene, Hufland, with die Dame and Dr. Soest.
What is Hufland doing? Click on the items below which best describe his actions
He is watching pretty women.
He is eavesdropping.
He is watching all the people going by.
He is keeping his eye on die Dame and Dr. Soest.
He is watching the guests at the hotel.
He is just sitting around.
Prima! Good eyes! Please go on to the next display.
Click here for feedback.

Figure 7
Macro-Level Checklist Question for Die Dame aus Amsterdam

This question directs students to note the visual extralinguistic information in the scene which discloses the role of the character in the story. Understanding the character's role is essential to support students' development of their understanding of the story line.

The checklist question format can also be used to bring students' attention to bear on specific information in video scenes. The question below asks students to identify the choices a waitress offers to Ramiro in a restaurant scene in *Zarabanda*.

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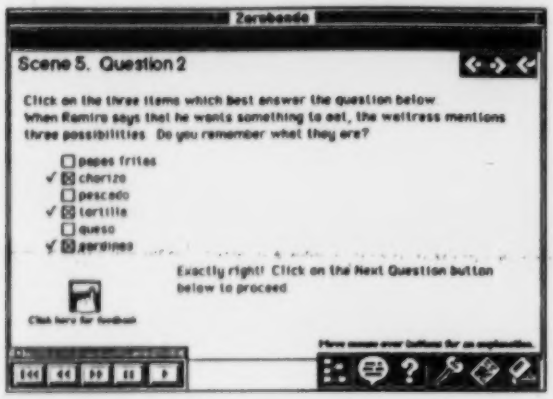
Zarabanda
Scene 5. Question 2
Click on the three items which best answer the question below
When Ramiro says that he wants something to eat, the waitress mentions three possibilities. Do you remember what they are?
papas fritas
chorizo
pescado
tortilla
queso
garbanzos
Exactly right! Click on the Next Question button below to proceed

Figure 8
Macro-Level Binary Checklist Question for Zarabanda

The binary checklist question solicits students' reactions to characters or situations which are best described in terms of opposing pairs of features. For example, the question below instructs students to describe the physical appearance of the mystery woman in *Die Dame aus Amsterdam* in order to support inferences about the woman herself and the way she interacts with other characters.

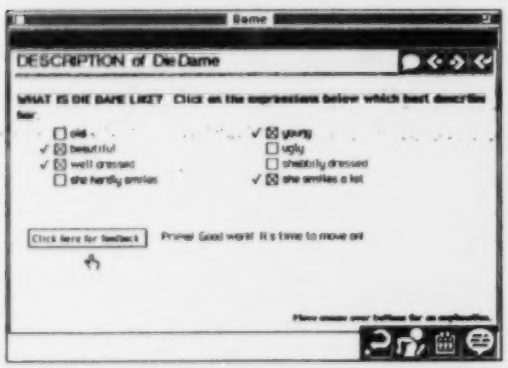

Figure 9
Macro-Level Binary Checklist Question for Die Dame aus Amsterdam

The binary checklist question format also applies to questioning techniques designed to explore micro-level details. In a scene in *La Marée et ses secrets*, an initial macro-level question first verified that students understood that an illicit deal was made between two men. Then that question was followed by the micro-level question below asking students to characterize the nature of the deal.

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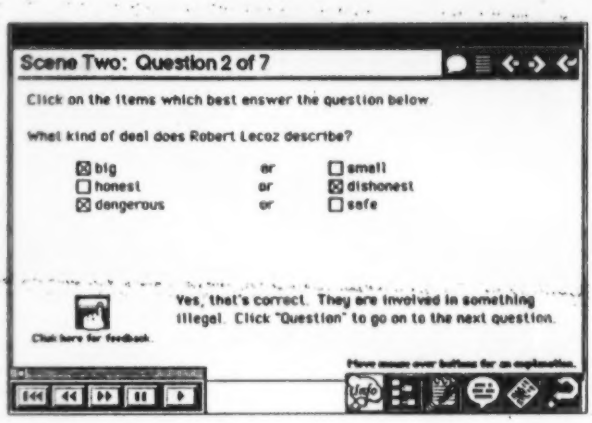
Scene Two: Question 2 of 7
Click on the items which best answer the question below.
What kind of deal does Robert Lecoz describe?
big or small
honest or dishonest
dangerous or safe
Yes, that's correct. They are involved in something illegal. Click "Question" to go on to the next question.
Click here for feedback.
Move mouse over buttons for an explanation.
Help

Figure 10
Micro-Level Binary Checklist Question for La Marée et ses secrets

Icon sorting questions require students to move icon buttons representing characters, scenes, or events to user-defined locations on the screen. This kind of questioning device is useful for placing characters or events in specific locations in the story, identifying group relationships among characters, or specifying the correct sequence of scenes in a story. The question below requests students to identify the characters who belong to the group of conspirators in *La Marée et ses secrets*.

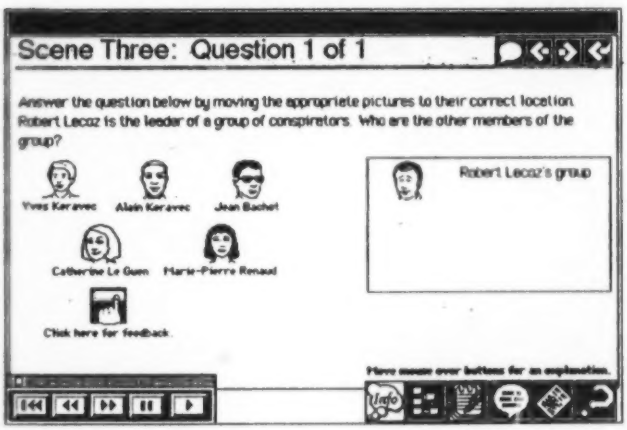
Scene Three: Question 1 of 1
Answer the question below by moving the appropriate pictures to their correct location.
Robert Lecoz is the leader of a group of conspirators. Who are the other members of the group?
Yves Keravec
Alain Keravec
Jean Bachot
Catherine Le Guen
Marie-Pierre Renaud
Robert Lecoz's group
Click here for feedback.
Move mouse over buttons for an explanation.
Help

Figure 11
Macro-Level Icon Sorting Question for La Marée et ses secrets

The open response question format allows students to respond to questions in their own words. As such, it is useful

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for soliciting students' reactions to individual events in the story or for having them write more complete summaries. The sample question below instructs students to write a summary of a story they have viewed.

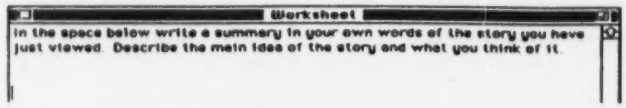
Worksheet
In the space below write a summary in your own words of the story you have just viewed. Describe the main idea of the story and what you think of it.

Figure 12
Open Response Question for La Marée et ses secrets

Sequences of the various question types described here can be combined in different ways to achieve specific instructional objectives. The set of questions below, taken from a scene in the German detective story, *Die Dame aus Amsterdam*, leads students through a series of comprehension checks progressing from macro-level comprehension to micro-level comprehension. Students answer the questions below after they have viewed a short scene in which a character is caught searching a hotel room.

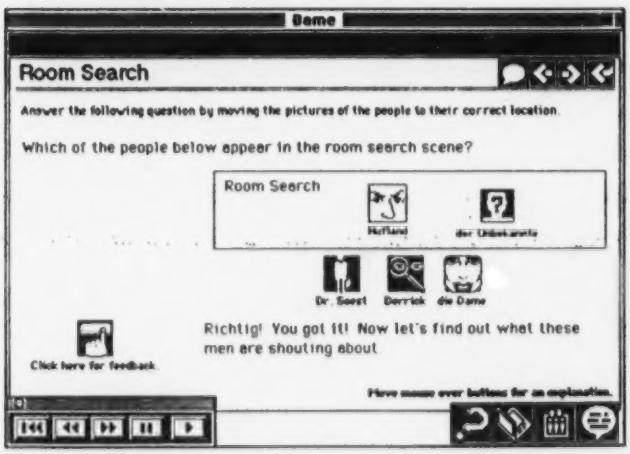
Dame
Room Search
Answer the following question by moving the pictures of the people to their correct location.
Which of the people below appear in the room search scene?
Room Search
Richtig! You got it! Now let's find out what these men are shouting about.
Click here for feedback.

Figure 13a
Macro-Level Question for Die Dame aus Amsterdam

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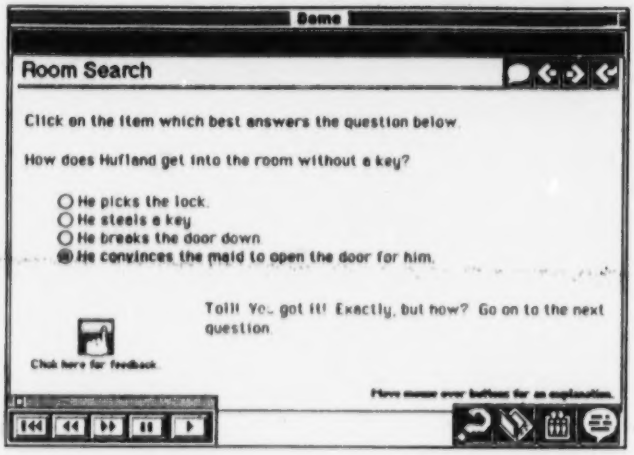
Dame
Room Search
Click on the item which best answers the question below.
How does Hufland get into the room without a key?
He picks the lock.
He steels a key.
He breaks the door down.
He convinces the maid to open the door for him.
Toll! Yo.. got it! Exactly, but how? Go on to the next question.
Click here for feedback.
Move mouse over buttons for an explanation.

Figure 13b
Micro-Level Question Number One for Die Dame aus Amsterdam

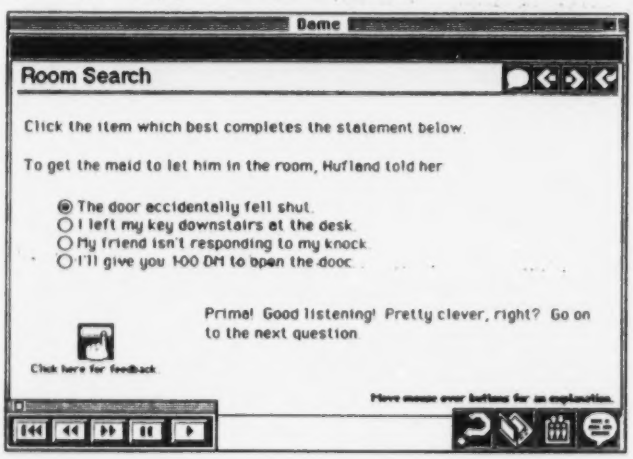
Dame
Room Search
Click the item which best completes the statement below.
To get the maid to let him in the room, Hufland told her
The door accidentally fell shut.
I left my key downstairs at the desk.
My friend isn't responding to my knock.
I'll give you 100 DM to open the door.
Prima! Good listening! Pretty clever, right? Go on to the next question.
Click here for feedback.
Move mouse over buttons for an explanation.

Figure 13c
Micro-Level Question Number Two for Die Dame aus Amsterdam

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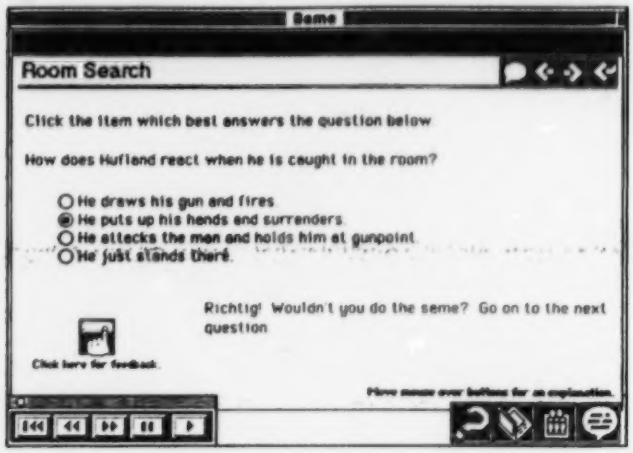
Dame
Room Search
Click the item which best answers the question below.
How does Hufland react when he is caught in the room?
He draws his gun and fires.
He puts up his hands and surrenders.
He attacks the man and holds him at gunpoint.
He just stands there.
Richtig! Wouldn't you do the same? Go on to the next question.

Figure 13d
Micro-Level Question Number Three for Die Dame aus Amsterdam

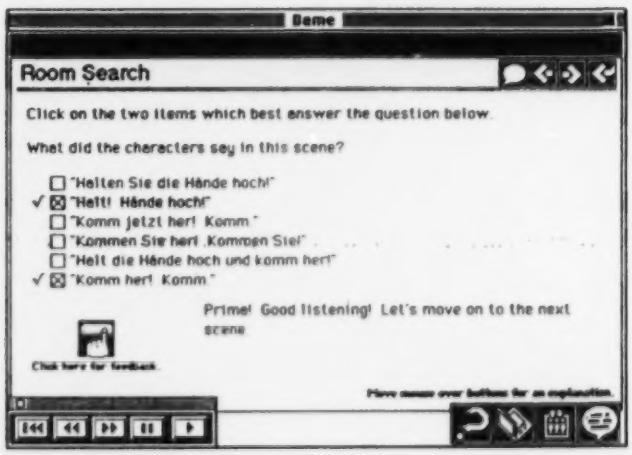
Dame
Room Search
Click on the two items which best answer the question below.
What did the characters say in this scene?
"Halten Sie die Hände hoch!"
"Halt! Hände hoch!"
"Komm jetzt her! Komm."
"Kommen Sie her! Kommen Sie!"
"Halt die Hände hoch und komm her!"
"Komm her! Komm."
Prima! Good listening! Let's move on to the next scene.

Figure 13e
Micro-Level Question Number Four for Die Dame aus Amsterdam

The first question, an icon sorting macro-level question, requires students to identify the characters who are involved in the scene. The next four questions are micro-level questions which direct students' attention to the salient details of the scene. The first three of the micro-level questions are multi-

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ple choice questions and the last one is a checklist question. The first micro-level question focuses on visual contextual information and asks students to observe how the character Hufland gets into the hotel room. The next question focuses on language and verifies that students have understood the dialog between Hufland and the hotel maid. Hufland is caught in the hotel room by another man, and the third micro-level question once again focuses on visual paralinguistic information. The last question instructs students to attend to the actual language spoken in this part of the scene. The combined effect of these macro- and micro-level questions is to help students to develop a complete functional understanding of the scene.

Learner Assistance Features

In addition to the five question formats presented here, *Libra* contains other authoring tools which support the design of helpful pedagogical features to guide students in the appropriate use of listening comprehension strategies. For example, recall that some students have difficulty identifying relevant sentence constituents as they parse sentences. *Libra*'s ancillary stacks, which can be made accessible to students at any point in a lesson, contain templates to develop help displays to facilitate this process. Suppose that beginning students were to encounter a sentence like *La personne que nous cherchons doit être disponible à partir du 5 août.* 'The person we are looking for must be available from August 5 on.' in a video program. To help them to identify the constituent parts of the sentence, students could call up a help display like the one below.

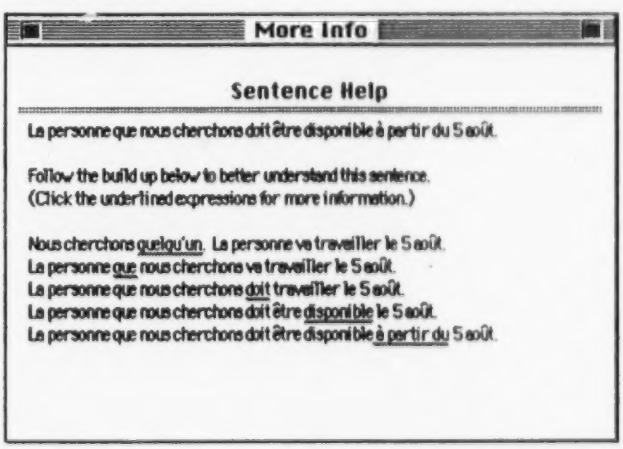
More Info
Sentence Help
La personne que nous cherchons doit être disponible à partir du 5 août.
Follow the build up below to better understand this sentence.
(Click the underlined expressions for more information.)
Nous cherchons quelqu'un. La personne va travailler le 5 août.
La personne que nous cherchons va travailler le 5 août.
La personne que nous cherchons doit travailler le 5 août.
La personne que nous cherchons doit être disponible le 5 août.
La personne que nous cherchons doit être disponible à partir du 5 août.

Figure 14
Ancillary Stack: Help Display

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This help display provides a progressive build up of the complex sentence and accents its important components. It explicates the meaning of the sentence by pointing out its constituent parts and showing how those parts are related to each other. If students need more information about specific elements in the sentence, they may click the hyperactive expressions which are linked to other help displays. Clicking the word *que*, for example, could call up a small window which displays *"que* = that, who; relative pronoun connecting the two sentences just above."

Students may also have difficulty identifying salient information embedded within the context of video scenes. *Libra*'s ancillary stacks include a template to create a help display equipped with a set of videoo buttons to delimit the precise videodisc segment containing the important information. For example, in a scene in which a character in *La Marée et ses secrets* behaves rather mysteriously, a micro-level question asks students if they think character is actually only pretending to be sick. If they need help to answer this question, they may call up the following help display.

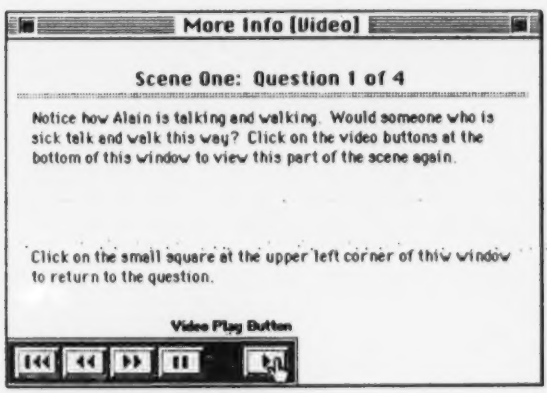
More Info [Video]
Scene One: Question 1 of 4
Notice how Alain is talking and walking. Would someone who is sick talk and walk this way? Click on the video buttons at the bottom of this window to view this part of the scene again.
Click on the small square at the upper left corner of this window to return to the question.
Video Play Button

Figure 15
Libra Ancillary Stack:
Video Help Display

The text in the help display prompts students to think about the character's actions and directs them to replay the part of the scene in which his actions betray his real intentions. Additional icon buttons linked to other help displays can be added to this help display to create a series of nested help displays to focus students' attention on progressively smaller segments of the scene.

Libra's script building tools can be used to develop written scripts of the video text tailored to students' needs and the instructional requirements of the lesson. Lesson authors may

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choose to make complete scripts of the video or partial scripts which highlight only important textual information. They may further choose which words and expressions to gloss or to define and the ways in which they wish to do so. Although *Libra* allows all the words in the script to be glossed, it is probably advisable in most instances to gloss only those words which carry important information in the text. For example the Spanish video script below gives students a partial script of a video scene from *Zarabanda*.

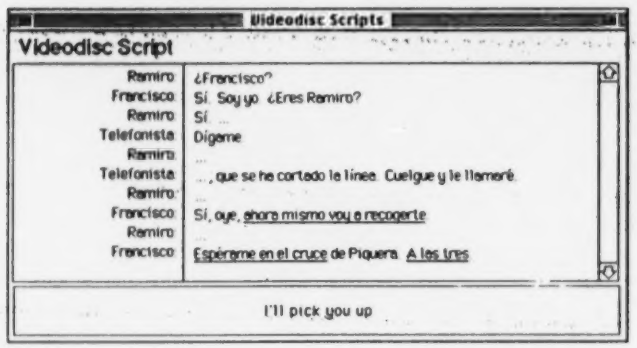
Videodisc Scripts
Videodisc Script
Ramiro ¿Francisco?
Francisco Sí. Soy yo. ¿Eres Ramiro?
Ramiro Sí. ...
Telefonista Digame
Ramiro ...
Telefonista ..., que se ha cortado la línea. Cuelgue y le llamaré.
Ramiro ...
Francisco Sí, oye, ahora mismo voy a recogerte
Ramiro ...
Francisco Espérame en el cruce de Piquera. A las tres
I'll pick you up

Figure 16
Libra Ancillary Stack:
Video Script Display

The ellipses indicate that words have been deleted from the script. Of the remaining words, only those which bear directly on the primary message of the scene are marked for further explanation. Thus the underlined phrase *ahora mismo voy a recogerte* is glossed to explain that one character will pick another character up, the central message of the scene. The details of where and when they will meet are expressed in glosses for *espérame en el cruce* 'wait for me at the crossroads and *A las tres* 'at three o'clock.' Since the underlined expressions are hyperactive expressions, they can also be linked to other explanatory devices such as digitized audio or graphics files. *Libra*'s script glossing tools also serve as the basis of user-definable dictionaries.

Libra and Foreign Language Listening Comprehension

Each of the authoring tools in *Libra* has been designed to enable faculty-authors to create lessons which model appropriate listening comprehension strategies and guide students in their use. They include straightforward procedures to make advance organizers such as pictorial cues, text maps, and vocabulary presentations; various kinds of comprehension checks to confirm students' understanding at both macro- and micro-levels of text processing; and student help features such

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as hyperactive text displays, help displays, video scripts, and dictionaries. Because of the inherent flexibility of *Libra*'s tools, faculty-authors may create specific combinations of instructional designs supported by tailor-made pedagogical assistance for different kinds of listening comprehension tasks. IAV programs which reflect the underlying paradigm of *Libra* and include appropriate learner assistance will provide students with a rich learning environment to facilitate their development of listening comprehension proficiency.

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[1] See the selected bibliography on listening comprehension at the end of this report.

[2] See Rivers 1986, 1987, and 1989 and Swaffar 1989.

[3] Numerous educators have commented on the instructional value of Computer-Assisted Language Learning and Interactive Video. See, for example, Schafer and Hannafin 1986, Douglas 1988, Bush and Crotty 1988, Schulz 1988, Verano 1989, Fletcher 1990, Garrett 1991, and the series of articles in Bush *et al* 1991 and Dunkel 1991.

[4] See O'Malley *et al* 1989 and Bacon 1992 for discussions of the application of these general principles to foreign language listening comprehension tasks.

[5] Richards 1983 calls the use of these kinds of strategies micro-level skills. Lund 1990, in his second language listening taxonomy, refers to them as aspects of the identification of surface structures. Rivers 1990 describes these strategies in detail and gives a lengthy list of exercise types designed to inculcate perception-segmentation skills in students.

[6] O'Malley *et al* 1989 and Bacon 1992 found that some students are unable to shift their focus from concrete words and phrases to sentence level parsing processes.

[7] For example, Rivers 1988 proposes that students be guided to analyze sentences in the form of Actor-Action-Object to facilitate sentence parsing.

[8] See Johnson-Laird 1983, van Dijk and Kintsch 1983, Kintsch 1988 and Kintsch *et al* 1990, Singer 1990, Gernsbacher 1990, and Smith 1991 for discussions of discourse comprehension processes and the function of mental representations in native language comprehension. See Brown 1989, Bernhardt and James 1986, Swaffar *et al* 1991, and Hammadou 1991 for discussion of these principles within the context of foreign language instruction.

[9] This example is taken from van Dijk and Kintsch 1983.

[10] Native language researchers have proposed different kinds of theories of textual cohesion ranging from general discourse coherence, to narrative structures, and to text grammars. See Schank 1982, van Dijk and Kintsch 1983, Wilensky 1983, Trabasso *et al* 1984, Meyer and Freedle 1984, Kintsch 1986, and Duffy *et al* 1990.

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[12] See Schank and Abelson 1977, Auble and Franks 1983, Perrig and Kintsch 1985, and Kintsch 1988 for discussion of schemata and their use in processing native language discourse. For discussion of the application of schema theory in foreign language education, see Hudson 1982, Carrell and Eisterhold 1983, the articles and reports in Carrell *et al* 1988, Byrnes 1984 and 1985, Bernhardt 1984, Chaudron and Richards 1986, Bernhardt and Berkemeyer 1988, Glisan 1988, Long 1989 and 1990, Swaffar *et al* 1991, and Hammadou 1991. See also Altman's 1990 exploratory discussion of schema theory and foreign language video.

[13] Wolff 1987 has found evidence that comprehenders use top-down processing over bottom-up processing in difficult stories and the reverse in easier stories. He attributes the difference in the use of strategies to students' lack of linguistic knowledge in more difficult texts. Hammadou 1991 has also found evidence that students at lower proficiency levels use top-down processing more often than students at higher proficiency levels. Conversely O' Malley *et al* 1989 have reported that ineffective foreign language listeners focus on individual words in very limited bottom-up approaches.

[14] Omaggio 1979, Byrnes 1984, Dunkel 1986, and Joiner 1986 have described the use of illustrations as advance organizers for foreign language comprehension tasks. Altman 1989 and Liskin-Gasparo and Véquez 1990 have recommended preteaching pertinent vocabulary. Carrell 1984, Weissenrieder 1987a, Long 1989, Lee and Riley 1990 have proposed previewing the narrative structure of the text.

[15] This proposal is similar to the one presented by Brown 1989 in which he recommended giving students an overview of the plot of stories to help them in comprehension tasks. The proposal being discussed here allows for a greater variety in the presentation of narrative structures.

[16] Dunkel 1986 has noted that beginning-level students have particular difficulty disentangling the thread of discourse in authentic language texts. Long 1989 has found that students have difficulty identifying key information and filtering out less important information in comprehension texts.

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Appendix B

Project Director's Comments

I do not have any substantial suggestions for improving the process for proposal writers or the degree to which FIPSE staff provides help to project directors, but I would like to take just a moment to offer my most sincere expression of gratitude to the FIPSE staff, especially Sandi Newkirk. FIPSE has what must be among the most stringent funding standards of any Federal agency. However, once funded, I could not have asked for better cooperation for my project. Sandi Newkirk was extremely patient with my problem with the Naval Academy and offered insightful, valuable advice in how to deal with that problem.

With respect to emerging new directions in the use of multimedia technology, the ever improving speed and power of the technology will allow for some very exciting possibilities in a few years. I believe that real-time video communication systems among countries will be widely and cheaply available within a year or two. When it is, cooperative student/faculty projects among countries will enable their respective educational institutions to introduce substantial amounts of on-going, authentic communication into their language programs which will support students' acquisition of truly functional proficiency in the language.

Again, in closing, I have had occasions over the past several years to talk with several members of the FIPSE staff. All of them have been consistently polite, extremely well versed in their respective disciplines, and willing to give generously of their time. If I may return the help I received from FIPSE during my project, I hope that FIPSE will not hesitate to call on me.